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AUTHOR	Koskenniemi, Matti; Holopainen, Pentti
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ABSTRACT

An attempt to record what pupils think and feel during the instructional process is the basis of this investigation of pupils' goal-related behavior. Two experiments are described that analyze what fourth grade pupils can tell about their activities during the instructional period when they are aided by an immediate videotape replay. These experiments are part of an investigation into the instructional processes, the first of which consisted of constructing a comprehensive taxonomy for describing the instructional process, especially in its interactive phase. The procedure for data collection and analysis is described. Both experiments indicated that pupils and experts perceive interactive study behavior in group work very similarly. This behavior is characterized by a clear role differentiation: goal related behavior of pupils remains quite stable from the beginning to the end of the lesson. The accuracy of these perceptions, however, decreases when more complex patterns are to be assessed. References and tables of data are included. Related documents are ED 073 013, ED 079 181, and ED 079 258. (Author/KSM)

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Matti Koskenniemi and Pentti Holopainen

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Investigations into the Instructional Process

IX. Pupils' Goal-related Behavior during the Instructional Interaction

1. Introduction

It is often mentioned that what pupils think and feel during the instructional process cannot be recorded in a reliable way. The only means to get information about pupils' thoughts and feelings seems to be retrospection, i.e., interview of pupils immediately after the instruction. Siegel et Al. (1963) have made an attempt to strengthen such a retrospection by using CCTV in the following way. The lesson was videotaped and played back to the pupils immediately after the instruction was closed. This replay was interrupted at regular intervals to allow the pupils to write down thoughts they had had while the recalled situation had been going on. On the basis of these recollections, strenghtened by TV, Siegel classified the pupils' thoughts according to their relevance to subject matter and, further, according to activity, independence, and so forth.[1]

The subjects in Siegel's investigation were undergraduates which was also the case in Bloom's experiments. It seems doubtful whether younger school children are able to give reliable information in such situations (cf. Koskenniemi 1971, 92). Elucidation of this problem therefore

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[1] Only after making use of the idea of stimulated recall by Siegel, in a way described later in this report, have we found out that Bloom had already presented a solution principally identical in 1953.

requires repeated experiments at this age level. What follows is a description of an attempt to analyse what fourth-grade pupils can tell about their activities during the instructional period, when they are aided by an immediate replay of a videotape just recorded.

The arrangement of the experiments was entrusted to the junior author of this report, and he is also responsible for collecting and processing the material (Paragraph 3).

2. The Need for Breaking the Black Box

What is the reason for our interest in what happens in the minds of pupils during the instructional process?

As already mentioned in previous reports of investigations into the instructional process at the Institute of Education, University of Helsinki (abbreviated OPA Helsinki) published in Research Bulletins numbers 26 to 32, and 34 (see, e.g., No. 26, pp. 8-9, and No. 34, pp. 61-62), the first part of this project consists in constructing a comprehensive, reliable and valid taxonomy for describing the instructional process, especially in its interactive phase (this term as defined by Jackson 1962; 1968). The accumulation and analysis of material for this purpose has, owing to the limited resources available, progressed slowly. The taxonomical instrument is, however, now ready for the next part of the project, comprising the period from summer 1973 to summer 1976.

Briefly the strategy of OPA Helsinki is as follows. First, by using the taxonomy mentioned above we intend to describe chains of instructional periods, e.g., all weekly lessons in a classroom. In this connection we try to find out, in terms of certain process variables, invariances within each separate period and, further, relations between consecutive periods.
Second, descriptions of instructional periods will be compared with certain group of independent variables assumed

to remain relatively constant during each period, such as "goals", "teacher", "pupil characteristics", and "class structure". These variables will be used for explaining the descriptions of different periods as such and as temporal chains (cf. the paradigm on the next page).

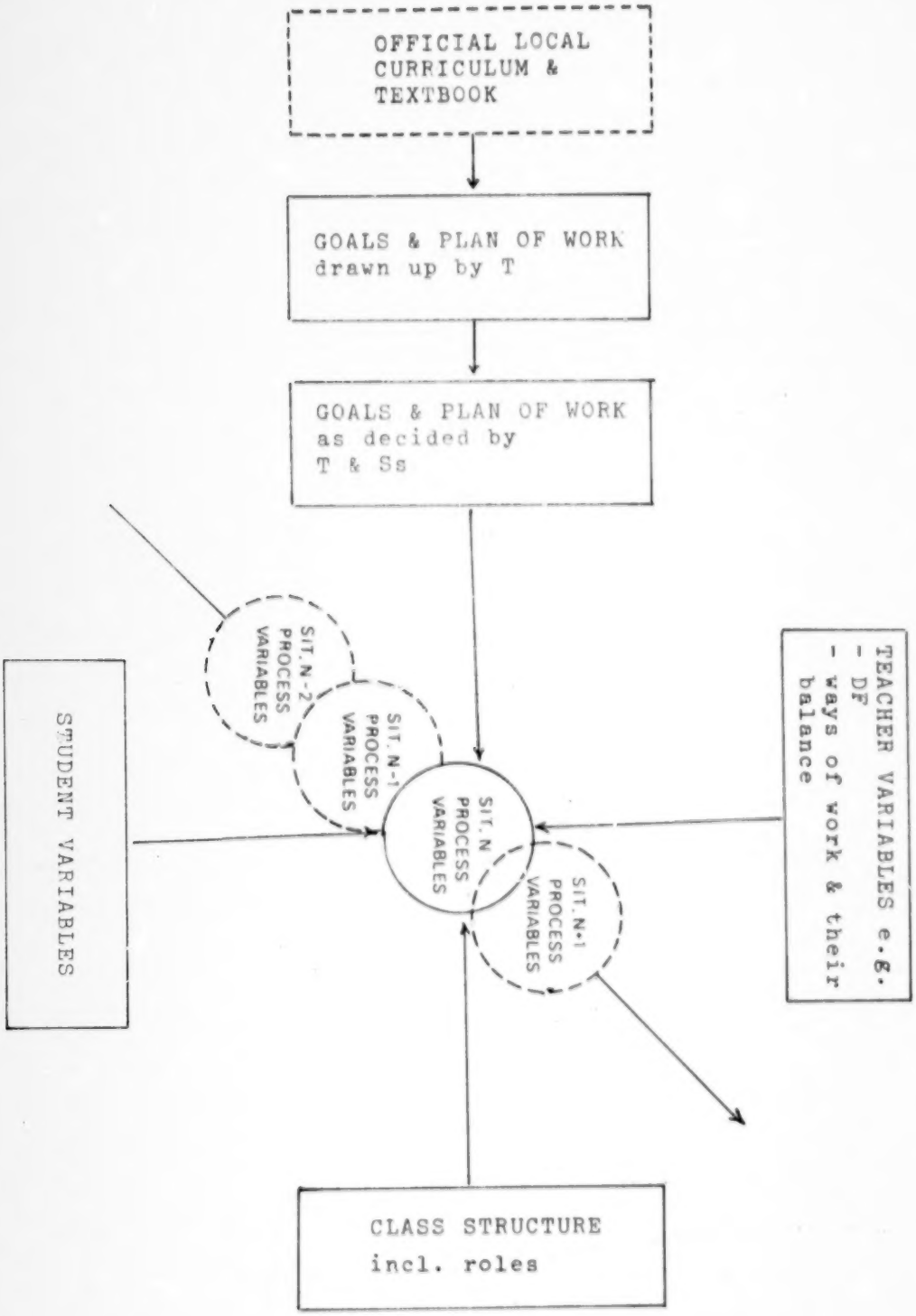
As the instructional process, among its other aspects, by definition is a purposive one, various intentions underlying the daily work in a classroom must be considered as variables of importance. Goals drawn up by the teacher and agreed upon by her pupils or, in the ideal situation, decided jointly by the teacher and her class are in fact one of the prerequisites for effective study.

In this short report there is no reason for discussing to what extent goals really are being formulated, concretized and decided in ordinary school life - either by teachers or pupils or by both together. The DPA Helsinki project, however, required arrangements through which these important variables could be operationalized in one way or another and taken into account.

The school class at the Institute of Education (Grade 3 or 4) has therefore through repeated exercises been trained to plan the next few days' programme within the weekly schedule and make decisions concerning it. With the help of systematic observation, either directly or through CCTV, it has been possible (although not easy) to rate the presence of certain goal-related behavior during the planning period, at least when concentrating on the most typical pupils of the class community.

After the school days which were preceded by joint planning an evaluative period for discussion of the realization and success of that plan was arranged. Such a situation provides opportunity to observe, i.a., whether any goal-related behavior has remained in the pupils. If so, it seems to justify the interpolative conclusion that corresponding behavior has also been present between planning and evaluation, i.e., during instructional situations proper.

Fig. 1. Research strategy of the DPA Helsinki


OFFICIAL LOCAL CURRICULUM & TEXTBOOK
GOALS & PLAN OF WORK drawn up by T
GOALS & PLAN OF WORK as decided by T & Ss
SIT.N-2 PROCESS VARIABLES
SIT.N-1 PROCESS VARIABLES
SIT.N PROCESS VARIABLES
SIT.N+1 PROCESS VARIABLES
STUDENT VARIABLES
TEACHER VARIABLES e.g.
- DF
- ways of work & their balance
CLASS STRUCTURE
incl. roles

The arrows indicate the direction of explaining, not connections.

Such a conclusion, however, is certainly vague. The stimulated recall, mentioned at the beginning of this paper, now comes into consideration. This arrangement seems to provide means to control the presence of goal-related behavior, which otherwise is based on a kind of interpolation.

Stimulated recall must of course be regarded as an unnatural break in the daily flow of study, and it can be used only a few times within a chain of instructional situations. This procedure presents, on the other hand, the only way to control if pupils' behavior is related to activated goals also during ordinary study situations after joint planning and deciding.

The modest experiments described in the next paragraph were arranged partly in a class without any experience of detailed and systematic planning of study, partly in another class which had been trained in joint decision-making in this respect. In both cases we tried to find out whether fourth-graders are capable of rating their own goal-relevant behavior and the behavior of their peers in study situations with help provided by video recordings.

3. The Procedure and Results

3.1. Experiment One

There are many reasons for assuming that fourth-graders are not capable of reproducing their thoughts during certain study situations, as Siegel's subjects were asked to do. Instead, we asked our subjects to rate the behavior, their own and their peers', from a number of various viewpoints. To facilitate this task the rating was done by ranking all group members according to certain behavior, relevant to the situation.

The problems:

(1) Are pupils capable of distinguishing different aspects of task-oriented behavior in ranking group members?
(2) What stability do such ratings have?
(3) How valid are these ratings as criteria when compared with experts' ratings?

In Experiment One (1971) the subjects were a fourth-grade study group (two girls, two boys) which met four times with intervals of one week. The topic the group was studying was the conservation of nature. The task was accompanied by short instructions given by the teacher. Each session was videotaped and replayed for pupils immediately after sessions.

The recall situation was divided into ten-minute sections and after viewing each section the pupils had to fill out a questionnaire with the following questions:

(1) Who in performing the given task was the most industrious in the group? Rank the other group members in order. Include yourself.
(2) Who presented most opinions of his own and asked for others' opinions? Rank the group members in order. Include yourself.
(3) Who gave suggestions and guidance? Rank the group members in order. Include yourself.
(4) Who was the most productive in the solution of the task? Rank the group members in order. Include yourself.

Later on, two experts viewed the same videotapes and rank-ordered the group members according to the criteria (1) --- (4). In addition, the experts also rated (5) planfulness and (6) tenacity at work.

The measure used for agreement between pupils' rankings within each ten-minute section and for each criterion is based on Kendall's Coefficient of Concordance, W (Hays 1963, 656-658). It is obtained from a matrix of rankings, each pupil (placed in vertical order on a series of rows) rank-

ing each pupil (placed in horizontal order on a series of columns), as follows:

$$W = \frac{12\ S}{m^2\ (n^2-n)}\ ,$$

where S equals the sum of the squares of the deviations of the column totals from the grand mean, and n equals the number of individuals ranked by m observers. In this case n=m, since each pupil ranked everyone in the group including himself. When agreement is perfect, W is equal to 1, and when there is no agreement at all W is equal to 0 (Bales & Slater 1955, 276).

To analyse the third problem, mean rankings for lessons 1 to 4 and throughout lessons were calculated for both pupils and experts. These figures were compared with each other.

Table 1 (p. 8) illustrates the pupils' mode of ranking the group members: inter-rater agreement, capacity to distinguish between different aspects of study behavior, and stability of rankings over sections of a lesson. The means and standard deviations of rankings by pupils and experts for all lessons are presented in Appendix 1. The agreement between pupils' and experts' rankings concerning individual group members is shown in Figure 2 (p. 9).

Table 1 indicates that pupils have a very high consensus when ranking each other in different aspects of task-related behavior. W-coefficients within ranking sections are, with some exceptions, systematically high. One explanation seems to be that the group in question was small and that the behavior pattern of one of the group members (B) did not vary at all. It must also be remembered that Kendall's W does not take the ranker-agreement by chance into account, and that the high values are therefore partly of a technical character.

When looking at Appendix 1 it can be seen that the mean

Table 1. Study Behavior Perceived in Stimulated Recall Situations: Rankings by Pupils, Lesson 4 (Experiment One)

Section (Minutes)		Ranking 1: Industriousness				Ranking 2: Opinions				Ranking 3: Guidance				Ranking 4: Productiveness			
	Pupils	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
0 - 10	A	3	4	2	1	3	4	2	1	3	4	1	2	3	4	2	1
	B	3	4	1	2	3	4	2	1	3	4	2	1	3	4	1	2
	C	3	4	2	1	2	4	3	1	3	4	2	1	3	4	2	1
	D	3	4	2	1	2	4	3	1	3	4	1	2	3	4	1	2
					W= .93				W= .90				W= .90				W= .90
11 - 20	A	3	4	2	1	3	4	2	1	3	4	2	1	3	4	2	1
	B	3	4	2	1	3	4	2	1	3	4	1	2	1	4	3	2
	C	3	4	2	1	2	4	3	1	2	4	3	1	3	4	2	1
	D	3	4	2	1	3	4	1	2	3	4	1	2	3	4	2	1
					W=1.00				W= .83				W= .78				W= .78
21 - 30	A	3	4	1	2	3	4	2	1	3	4	1	2	3	4	2	1
	B	3	4	1	2	3	1	2	4	3	2	1	4	3	4	2	1
	C	3	4	2	1	3	4	2	1	2	4	3	1	3	4	2	1
	D	3	4	1	2	3	4	1	2	2	3	4	1	3	4	2	1
					W= .93				W= .32				W= .18				W=1.00
31 - 40	A	3	4	2	1	3	4	2	1	3	2	4	1	4	2	3	1
	B	3	4	2	1	3	4	2	1	3	4	1	2	3	4	2	1
	C	3	4	1	2	2	4	3	1	3	4	2	1	3	4	2	1
	D	3	4	1	2	1	4	2	3	1	4	2	3	3	4	2	1
					W= .90				W= .68				W= .41				W= .78

ranks and standard deviations are quite stable from one ranking aspect to another and similarly from lesson to lesson. The only exception are rankings of pupil C who is more variable than others in her behavior and, consequently, more difficult to be ranked.

The agreement between pupils' and experts' mean rankings over lessons is illustrated in Figure 2. These means are very close to each other in every aspect, which can also be seen from correlations between the mean rankings:

lesson 1	r = .97	all lessons = .95
lesson 2	r = .90	
lesson 3	r = .88	
lesson 4	r = .95	

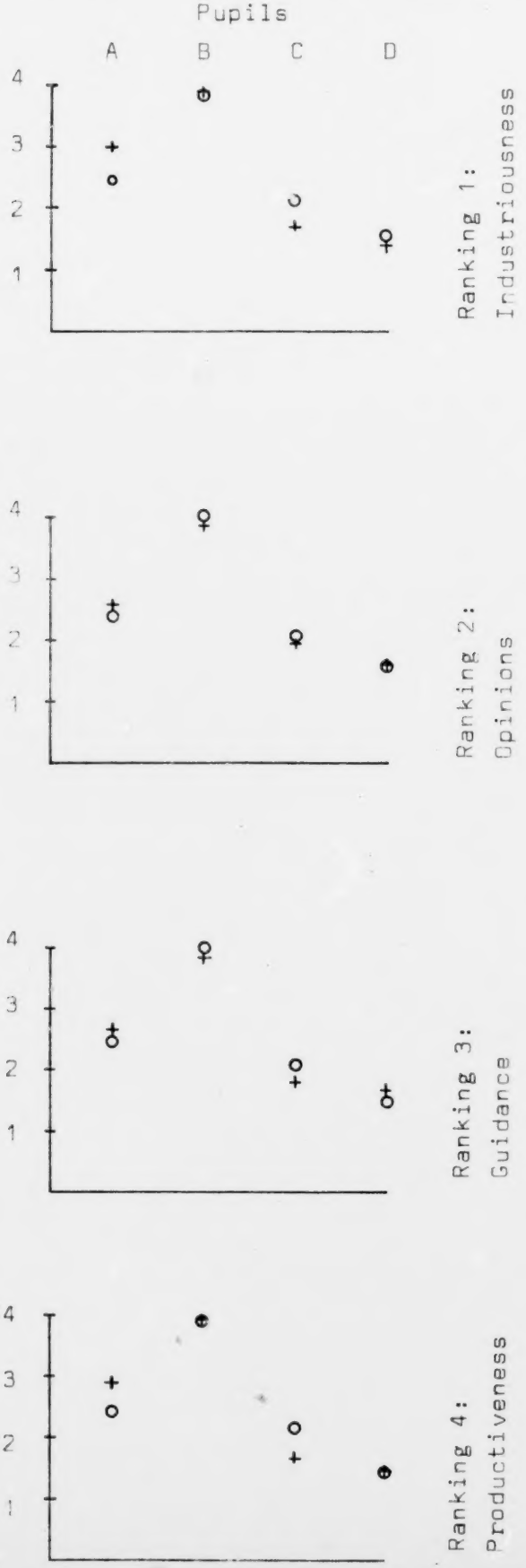
The experts also rated planfulness and tenacy at work (cf. p. 6), but these rankings appeared to be very close to those obtained by rating the other aspects of behavior. Tenacy at work, e.g., seems to overlap too much with industriousness to allow differentiation between these two. - Inter-expert agreement as such was considerably high. In a total of (16x6=) 96 cases W was found to be 1.00 in 60 cases, .90 in 16, and .70 in 20 cases.

Despite the technical biases it seems justifiable to conclude that both pupils' and experts' perceptions of task-related behavior in group work show systematic similarity. Both are stable but different aspects of behavior cannot be distinguished from each other. This seems to validitate the role differentiation hypothesis stated in several small group investigations.

3.2. Experiment Two

A second experiment was carried out two years later (1973) with a new group of fourth-grade pupils (two girls, two boys), topic under study being Siberian vegetation zones. Before group work the members had participitated in joint planning of and decision on future work with the teacher and

Fig. 2. Mean Ranks of Pupil Behavior:
Rankings by Pupils (o) and Experts (+) over Lessons



other pupils of the class.

One lesson was videotaped and immediately played back to the group. The questionnaire to be filled out was very similar to that used in the first experiment, but an additional question was introduced: Who followed the common plan most properly?

As Table 2 indicates, the rankings performed by pupils are again very consistent with each other. Kendall's coefficients are rather high within all sections and aspects, the only exception being Planfulness (Who followed the common plan most properly) where the W's are rather low. The same fact is seen in standard deviations of pupils' and experts' mean rankings (Appendix 2) which are higher in the fifth ranking than in others.

Experts' rankings are, as judged by the standard deviations, more consistent than the ones done by the pupils. This is also reflected in the W's. The agreement between experts' and pupils' rankings was, on the other hand, very high ($r = .96$).

4. Discussion

Both experiments indicate that pupils and experts perceive, the interactive study behavior in group work very similarly. This behavior is characterized by a clear role differentiation, i.e., goal-related behavior of pupils remain quite stable from the beginning to the end of the lesson. The accuracy of these perceptions, however, decreases when more complex patterns are to be assessed.

Comparing the results with those obtained by Bloom and Siegel, it seems that at fourth-grade level it is not possible to describe and/or classify separately complex chains of goal-related study behavior, neither by information obtained from pupils in stimulated situations nor by experts' ratings. Even though the pupils rank their behavior consist-

Table 2. Study Behavior Perceived in a Stimulated Recall Situation: Rankings by Pupils (Experiment Two)

Section (Minutes)	Ranking 1: Industriousness					Ranking 2: Opinions					Ranking 3: Guidance					Ranking 4: Productiveness					Ranking 5: Planfulness				
	Pupils	E	F	G	H	E	F	G	H		E	F	G	H		E	F	G	H		E	F	G	H	
0 - 10	E	4	2	3	1	4	2	3	1		4	1	3	2		4	2	3	1		4	2	3	1	
	F	4	2	3	1	4	3	2	1		4	2	3	1		4	2	3	1		4	1	3	2	
	G	4	1	3	2	4	2	3	1		4	2	3	1		4	1	3	2		4	2	3	1	
	H	4	1	3	2	4	1	3	2		4	3	2	1		4	1	3	2		3	4	1	2	
					W= .90				W= .83					W= .83					W= .90					W= .53
11 - 20	E	4	3	2	1	4	1	3	2		4	3	2	1		4	2	3	1		4	3	2	1	
	F	4	1	3	2	4	3	1	2		4	2	3	1		4	1	3	2		2	4	3	1	
	G	4	1	3	2	4	1	3	2		4	2	3	1		4	2	3	1		4	1	3	2	
	H	4	2	3	1	4	1	3	2		4	2	3	1		3	1	4	2		4	3	1	2	
					W= .78				W= .70					W= .93					W= .83					W= .78
21 - 30	E	4	3	2	1	4	2	3	1		4	1	3	2		4	3	2	1		4	3	2	1	
	F	4	3	1	2	3	1	4	2		4	1	2	3		4	3	2	1		4	3	2	1	
	G	4	2	3	1	4	1	3	2		4	2	3	1		4	2	3	1		4	1	3	2	
	H	4	3	2	1	3	1	2	4		3	1	4	2		4	1	3	2		2	4	1	3	
					W= .83				W= .58					W= .73					W= .78					W= .38
31 - 40	E	4	3	2	1	4	1	3	2		4	3	2	1		4	3	2	1		3	4	2	1	
	F	4	2	3	1	4	2	3	1		4	1	3	2		4	3	2	1		4	1	3	2	
	G	4	2	3	1	4	2	3	1		4	3	2	1		4	3	2	1		4	3	2	1	
	H	4	2	3	1	4	1	3	2		4	1	3	2		2	1	4	3		4	1	3	2	
					W= .93				W= .90					W= .70					W= .40					W= .53

ently, the halo effect apparently plays a prominent role in their perceptions. Reliable and specific information about behavior related especially to the jointly discussed and decided study goals could not be obtained in this way within a small material like ours. It is possible that the group situation with its emergent role differentiation overshadows the joint discussion of the goals to be strived for.

More experiments with specified and concrete definitions of goal-related behavior in different study situations and at different age levels are therefore needed.

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Appendix 1.

Study Behavior Perceived in Stimulated Recall Situations: Rankings by Pupils and Experts, Means and Standard Deviations by Lessons and over Lessons (Experiment One)

Lesson			Ranking 1: Industriousness				Ranking 2: Opinions				Ranking 3: Guidance				Ranking 4: Productivity			
	Pupils		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	Pupils	$\bar{R}$	2.92	4.00	1.91	1.17	2.75	4.00	1.92	1.33	2.58	4.00	1.67	1.75	3.00	4.00	1.75	1.25
		s	.28	.00	.28	.55	.59	.00	.64	.47	.76	.00	.62	.72	.00	.00	.43	.43
	Experts	$\bar{R}$	2.75	4.00	2.00	1.25	2.88	4.00	1.75	1.38	2.75	4.00	1.75	1.50	2.75	4.00	2.13	1.13
		s	.43	.00	.71	.43	.33	.00	.66	.48	.43	.00	.66	.71	.43	.00	.60	.33
2	Pupils	$\bar{R}$	2.94	3.88	1.69	1.50	2.88	3.69	1.81	1.63	2.81	3.75	1.81	1.63	2.88	4.00	1.56	1.56
		s	.66	.33	.68	.50	.60	.77	.73	.86	.73	.74	.81	.60	.48	.00	.61	.50
	Experts	$\bar{R}$	2.25	4.00	2.50	1.25	2.13	4.00	2.38	1.50	2.50	4.00	2.50	1.00	2.38	4.00	1.88	1.25
		s	.66	.00	.71	.43	.60	.00	.86	.71	.50	.00	.50	.00	.86	.00	.60	.43
3	Pupils	$\bar{R}$	3.13	3.75	1.63	1.50	2.13	4.00	1.94	1.94	2.63	3.94	1.75	1.69	2.81	4.00	1.38	1.81
		s	.60	.43	.70	.50	.70	.00	.83	.90	.78	.24	.66	.77	.53	.00	.48	.63
	Experts	$\bar{R}$	2.25	4.00	1.75	2.00	1.88	4.00	2.00	2.13	2.25	4.00	1.88	1.88	2.13	4.00	2.38	1.50
		s	.43	.00	.97	.87	.78	.00	.87	.78	.66	.00	.78	.93	.33	.00	.86	.87
4	Pupils	$\bar{R}$	3.00	4.00	1.63	1.38	2.63	3.81	2.13	1.44	2.69	3.68	1.94	1.69	2.94	3.88	1.19	2.00
		s	.00	.00	.48	.48	.60	.73	.60	.86	.58	.68	1.04	.85	.56	.48	.39	.50
	Experts	$\bar{R}$	2.50	4.00	2.25	1.75	2.63	4.00	2.13	1.25	2.25	4.00	2.25	1.50	2.50	3.50	.25	1.75
		s	1.12	.00	.83	.83	.48	.00	.60	.66	.97	.00	.66	.50	1.12	.87	.87	.83
All	Pupils	$\bar{R}$	3.00	3.90	1.70	1.40	2.58	3.87	1.95	1.60	2.68	3.83	1.80	1.68	2.90	3.92	1.67	1.47
		s	.48	.30	.59	.52	.69	.56	.72	.84	.72	.55	.81	.74	.47	.23	.57	.56
	Experts	$\bar{R}$	2.44	3.88	2.13	1.56	2.38	4.00	2.06	1.56	2.44	4.00	2.09	1.47	2.44	3.88	2.16	1.41
		s	.75	.48	.86	.75	.70	.00	.79	.75	.70	.00	.72	.71	.79	.48	.75	.70

Appendix 2.

Study Behavior Perceived in a Stimulated Recall Situation: Rankings by Pupils and Experts, Means and Standard Deviations (Experiment Two)

		Ranking 1: Industriousness				Ranking 2: Opinions				Ranking 3: Guidance				Ranking 4: Productivity				Ranking 5: Planfulness			
Pupils		E	F	G	H	E	F	G	H	E	F	G	H	E	F	G	H	E	F	G	H
Pupils	$\bar{R}$	4.00	2.06	2.69	1.31	3.88	1.56	2.82	1.75	3.94	1.88	2.75	1.44	3.75	1.94	2.81	1.44	3.63	2.50	2.31	1.56
	s	.00	.56	.58	.46	.33	.70	.63	.75	.24	.78	.56	.61	.56	.83	.63	.61	.70	1.17	.77	.61
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